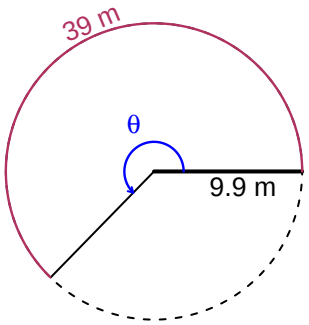
Name: Date:

Trig Final (Solution v42)

- You should have a calculator (like Desmos) and a unit-circle reference sheet.

Question 1

In the figure below, we see a circle and a central angle that subtends an arc. The arc length is 39 meters. The radius is 9.9 meters. What is the angle measure in radians?

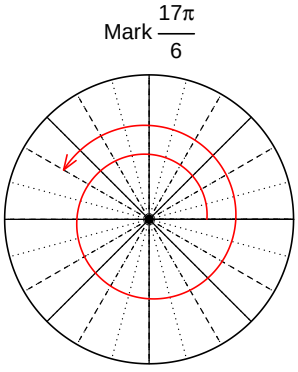


$$\theta = \frac{L}{r} \qquad r = \frac{L}{\theta} \qquad L = r\theta$$

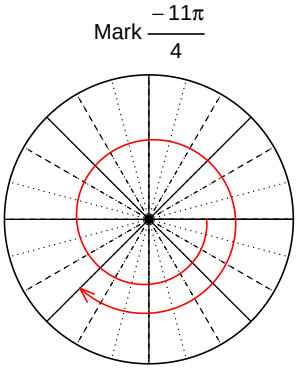
$\theta = 3.939$ radians.

Question 2

Consider angles $\frac{17\pi}{6}$ and $\frac{-11\pi}{4}$. For each angle, use a spiral with an arrow head to **mark** the angle on a circle below in standard position. Then, find **exact** expressions for $\sin\left(\frac{17\pi}{6}\right)$ and $\cos\left(\frac{-11\pi}{4}\right)$ by using a unit circle (provided separately).



Find $\sin(17\pi/6)$



Find $\cos(-11\pi/4)$

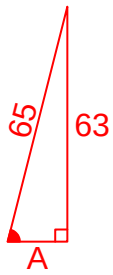
$\sin(17\pi/6) = \frac{1}{2}$

$\cos(-11\pi/4) = \frac{-\sqrt{2}}{2}$

Question 3

If $\sin(\theta) = \frac{-63}{65}$, and θ is in quadrant III, determine an exact value for $\cos(\theta)$.

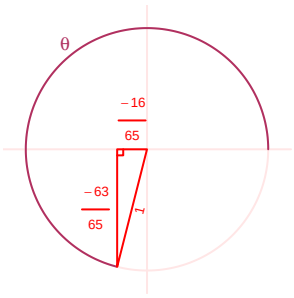
Ignore any negatives and the quadrant, and draw a right triangle (based on SOHCAHTOA) in standard (quadrant I) orientation.



Solve the Pythagorean Equation

$$A^2 + 63^2 = 65^2$$
$$A = \sqrt{65^2 - 63^2}$$
$$A = 16$$

Rescale the triangle so the hypotenuse is 1. Reflect the triangle into Quadrant III in a unit circle.



$$\cos(\theta) = \frac{-16}{65}$$

Question 4

A mass-spring system oscillates vertically with a frequency of 4.37 Hz, a midline at $y = -2.87$ meters, and an amplitude of 6.56 meters. At $t = 0$, the mass is at the midline and moving up. Write an equation to model the height (y in meters) as a function of time (t in seconds).

Any of these equations would get full credit.

$$y = 6.56\sin(2\pi 4.37t) - 2.87$$

or

$$y = 6.56\sin(8.74\pi t) - 2.87$$

or

$$y = 6.56\sin(27.46t) - 2.87$$